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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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JOHN P. O'BANION O'BANION & RITCHEY LLP 400 CAPITOL MALL SUITE 1550 SACRAMENTO, CA 95814			HEINRICHS, CHRISTOPHER P	
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			2663	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/939,529

Applicant(s)

GARCIA-LUNA-ACEVES ET AL.

Examiner

Christopher P. Heinrichs

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 8/24/2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 11/30/2001.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 1 is objected to because of the following informalities: the limitation "...if no suitable route is found in the routing table" refers to a routing table that is not described prior to the limitation. It is suggested that "...in a routing table" be used. Appropriate correction is required.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
2. Claims 27 and 32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
3. Claim **27** recites the limitation "last routing message" in line 2. There is insufficient antecedent basis for this limitation in the claim.
4. With regard to claim **32**, there is a lack of clarity introduced in the lines labeled (i), (ii), and the statement following both.

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5. Regarding the last line, "wherein the distance value of the route from node i to node y through neighbor p is the distance value of the route from node i to node y through neighbor x ," if distance value is intended to be distance then this states that the distances are equal and renders the limitations (distance comparisons "greater than" and "less than") of the previous elements of the claims useless as neither will ever be true. If this last line is intended, as would be appropriate in light of the previous limitations of the claim, to define the mathematical symbols D_{yp}^i and D_{yx}^i , then the line should read "wherein D_{yp}^i is the distance value of the route from node i to node y through neighbor p , and D_{yx}^i is the distance value of the route from node i to node y through neighbor x ." The examiner will consider the suggested modification as otherwise this line renders the claim indefinite.

6. Element (i) concludes with the limitation $D_{yp} < D_{yx}$, while element (ii) concludes with the limitation $D_{yp} > D_{yx}$. Firstly, as the "and" at the end of element (i) requires that the following limitations be true for selecting a neighbor, the two mathematical comparisons logically anded together ensure that a neighbor will never be selected because the two comparisons can never be true simultaneously. Furthermore, the comparison of element (ii) is contradictory to how the specification defines a how a neighbor is selected (page 4 lines 4-8):

Finally, function RT-update of FIG. 8 is called to update routing table entries and it iterates through each known destination, picking the neighbor k as a successor to destination j if both of the following conditions are met:

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1. *k offers the shortest distance to all nodes in the path from j to i.*
2. *path from j to k contains neither i or any repeated nodes.*

7. The comparison of element (ii) causes a path longer than the shortest path to be selected, rendering this claim indefinite. For the purposes of examination this limitation will be removed.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 9, and 13-14 are rejected under 35 U.S.C. 102(a) as being anticipated by Perkins et al, "AD-HOC ON-DEMAND DISTANCE VECTOR ROUTING," Proceedings 2nd IEEE Workshop, Mobile Computing System and Applications, pp. 90-100, February, 1999.

3. With regard to claim 1, Perkins discloses a method of routing data packets between nodes in a wireless network comprising receiving data packet traffic for

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a destination node ("Further, a node does not have to discover and maintain a route to another node...unless the former node is offering its services as an intermediate forwarding station to maintain connectivity between two other nodes," the connectivity being data received at the former node destined for the latter node, page 2 col 1 last two lines – col 2 first three lines), dynamically tracing a route to said destination node (Path discovery, page 2 section 2.1) in response to receipt of said traffic if no suitable route is found in the routing table (Path discovery, page 2 section 2.1, first paragraph), loop-checking the complete path (use of the destination sequence number in RREQ packet, which is used to dynamically trace the route, described on page 3 section 2.1.1, the significance of the sequence number with respect to loop-checking described on page 2 in the last paragraph before section 2.1, "...dynamically establishing route table entries at intermediate nodes...we borrow the concept of destination sequence numbers...each ad-hoc node maintains a monotonically increasing sequence number counter which is used to supercede stale cached routes. The combination of these techniques...ensures loop free routing) prior to entering said dynamically traced route into said routing table (page 3, second-to-last paragraph, "each node along the path (including source of RREQ) sets up a forward pointer...updates its timeout information...and records the latest destination sequence number), and transmitting (begins data transmission, page 4 first paragraph) said traffic to said destination node according to said routing table.

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4. With regard to claim 9, Perkins discloses all aspects of the method of claim 1 and further discloses that said dynamic tracing of routes to the destination is performed by sending query commands (route request packet, RREQ, page 2 section 2.1) to discover routing information (route reply packet, RREP, page 3, section 2.1.2, 1st paragraph) from neighboring nodes (neighbors, page 2 section 2.1).
5. With regard to claims 13 and 14, Perkins discloses all aspects of the method of claim 1 and further discloses that nodes learn of their neighbors in one of two ways: receiving a broadcast from a neighbor (Query) or a hello message (Update) (page 5, section 2.4, first paragraph). Nowhere does Perkins state that a link-layer protocol is necessary for monitoring link connectivity with neighbors.
6. Claims 15-30, 32-33 are rejected under 35 U.S.C. 102(a) as being clearly anticipated by Murthy et al., "AN EFFICIENT ROUTING PROTOCOL FOR WIRELESS NETWORKS," ACM Mobile Networks and Application Journal, pp. 183-197, October, 1996.
7. With regard to claim 15, Murthy discloses a method for routing data packets in a wireless network at a node I (fig 3) comprising maintaining a routing table (page 6, immediately following fig 2) of one or more known neighbors along with link cost to said known neighbors (j, fig 3), performing loop checking of complete paths (page 9, bullet points at top of page and 1st subsequent

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paragraph) prior to an entry being made into the routing table (procedure RT_Update, page 8 last paragraph), and broadcasting a routing message (routing table update messages, page 7 section 2.3, 1st paragraph) from said node, said routing message comprising a vector of entries (update list, page 7 section 2.3, bullet point 3), wherein each entry in said vector of entries corresponds to a route in the routing table ("sends its entire routing table", page 7, last paragraph) and wherein each said entry in said vector of entries contains a destination identifier j (destination), the distance to the destination D_{yi} (distance to destination), and the second-to-last hop to that destination p_{ji} (predecessor to the destination) (page 6 immediately subsequent to fig 2).

8. With regard to claim 16, Murthy discloses all aspects of the method of claim 15 and further discloses method steps wherein a first node considers a second as its neighbor if it hears update messages from said second node (page 3 last two lines – page 4 first line) and wherein said first node no longer considers said second node as its neighbor if said first node cannot send data packets to said second node (page 9, second to last paragraph, last sentence).

9. With regard to claim 17, Murthy discloses all aspects of the method of claim 15 and further discloses a method wherein said routing table contains entries for all known destinations with each entry comprising a destination identifier j , the successor to that destination s_{ij} , the second-to-last-hop to the

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destination p_{ij} , the distance to the destination D_{ij} and a route tag tag_{ij} (page 6, immediately following fig 2).

10. With regard to claim 18, Murthy discloses all aspects of the method of claim 17 and further discloses a method wherein when the element tag_{ij} is set to a value of Correct, it implies a loop-free finite value route (simple path), and wherein when element tag_{ij} is set to Null it implies that the route still remains to be checked (destination that has not been marked), and wherein when the element tag_{ij} is set to Error a route with a loop is implied (page 6, last bullet point in list following fig 2).

11. With regard to claim 19, Murthy discloses all aspects of the method of claim 18 and further discloses maintaining a distance table at said node, wherein said distance table at router i comprises a matrix of distance values of the route from l to j through k , D_{ijk} and the second-to-last-hop (predecessor) p_{ijk} on that route (page 4 last paragraph).

12. With regard to claim 20, Murthy discloses all aspects of the method of claim 19 and further discloses that D_{ijk} is set to $RD_{kj} + l_{ik}$ (see fig 1, Procedure DT) where RD_{kj} is the distance from k to j reported to i in the last routing message (see fig 1, Procedure Message) and l_{ik} is the cost of link (i,k) (page 7 lines 1-2).

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13. With regard to claim 21, Murthy discloses all aspects of the method of claim 20 and further discloses that the link cost is a function of hop count (page 7 line 1).

14. With regard to claim 22, Murthy discloses all aspects of the method of claim 20 and further discloses that the link cost is a function of latency (page 7 lines 1-2).

15. With regard to claim 23, Murthy discloses all aspects of the method of claim 20 and further discloses that link cost (distance entry in node's distance tables) is a function (when a link fails said distance entry is marked as infinity) of bandwidth (a link is assumed to exist between two nodes only if there is radio connectivity, of which bandwidth is a property) (see page 4 second paragraph).

16. With regard to claim 24, Murthy discloses a method for routing data packets in a wireless network at a node comprising routing data packets ("for the purposes of routing", page 4 sec 2.2, 1st paragraph) based on entries in a maintained routing table of one or more known neighbors ("...the case in which a node identifies a new neighbor and sends its entire routing table...", page 7 last paragraph) along with link cost to said known neighbors (link cost table, page 6, 2nd to last paragraph); wherein the routing table contains entries for all known destinations, each said entry in said routing table comprising a destination identifier j, the successor to said destination, the second-to-last hop to the

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destination pyi, distance to the destination Dj , and a route tag tagj (page 6 immediately subsequent to fig 2).

17. With regard to claim 25, Murthy discloses all aspects of the method of claim 24 and further discloses all aspects of claim 25 as set forth in the rejection of claim 18.

18. With regard to claim 26, Murthy discloses all aspects of the method of claim 25 and further discloses all aspects of claim 26 as set forth in the rejection of claim 19.

19. With regard to claim 27, Murthy discloses all aspects of the method of claim 26 and further discloses all aspects of method of claim 27 as set forth in the rejection of claim 20.

20. With regard to claim 28, Murthy discloses all aspects of the method of claim 27 and further discloses all aspects of method of claim 28 as set forth in the rejection of claim 21.

21. With regard to claim 29, Murthy discloses all aspects of the method of claim 27 and further discloses all aspects of method of claim 29 as set forth in the rejection of claim 22.

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22. With regard to claim 30, Murthy discloses all aspects of the method of claim 27 and further discloses all aspects of the method of claim 30 as set forth in the rejection of claim 23.

23. With regard to claim 32, Murthy discloses a method for Maintaining a route to a destination (Processing an Update, page 8) comprising selecting (i chooses p) a neighbor p as the next hop in a route from node i to destination j (predecessor, page 8 second-to-last line) if the path from neighbor p to destination j does not include node i and does not repeat any node (page 9, first bullet point at top of page) and $D_{iyp} < D_{iyx}$ for any other neighbor x and for all nodes y that are in the path from destination j to neighbor p (page 9, first bullet point), wherein D_{iyp} is the distance value of the route from node i to node y through neighbor p, and D_{iyx} is the distance value of the route from node i to node y through neighbor x (notation implicitly described in description of distance table, page 4 last paragraph).

24. With regard to claim 33, Murthy discloses all aspects of the method of claim 32 and further discloses sending (sends) updates to a routing table (recomputes the distances to predecessors) if either (i) a node loses the last path to a destination (when a link fails) or (ii) a node suffers a distance increase to a destination (link cost changes) page 10, paragraph just before "2.5-Example".)

Claim Rejections - 35 USC § 103

25. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

26. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

27. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perkins et al, "AD-HOC ON-DEMAND DISTANCE VECTOR ROUTING," Proceedings 2nd IEEE Workshop, Mobile Computing System and Applications, pp. 90-100, February, 1999, in view of U.S. Patent #6,768,738 to Yazaki et al.

28. Regarding claims 2 and 3, Perkins discloses all aspects of the routing method of claim 1 but fails to explicitly disclose a data packet received for transmission comprising a header with source and destination information and that does not contain a sequence number, or equivalent, associated with the

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destination node. However, Yazaki discloses an apparatus (packet forwarding apparatus) that performs, inherently, a method of routing data packets wherein a data packet (fig 3) received for a transmission comprises a header (fig 3 items 400-411) with source (fig 3 item 402) and destination (fig 3 item 403) information. Furthermore, Yazaki teaches nowhere about the use of a sequence number or equivalent associated with the destination node. It would have been obvious to one ordinarily skilled in the art at the time of the invention to include the data packet received for transmission disclosed by Yazaki with the method of routing data packets disclosed by Murthy to arrive at the invention of claims 2 and 3. The motivation to do so would have been that methods of routing data packets typically include placing in packet headers destination information so that the routing entities can know where the packet needs to go and source information so that a destination may communicate with a sender in response to a packet. A sequence number is not necessary for sending a packet from a source destination, as is seen in the packet disclosed by Yazaki.

29. Claims 4-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perkins et al. in view of Murthy et al.

30. With regard to claim 4, Perkins discloses all aspects of the invention of claim 1 but fails to disclose that the dynamic tracing obtains information about the length and second-to-last hop of the shortest path to all known destinations. However, Murthy discloses a route discovery method (path finding algorithm

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(PFA), page 3 paragraph 3) that obtains information about the length (Dij) and second-to-last hop (predecessor pij) of the shortest path to each destination whereby counting to infinity problems are avoided (page 3, first 2 lines). It would have been obvious to one ordinarily skilled in the art at the time of the invention to include the information disclosed by Murthy with the dynamic source tracing disclosed by Perkins to arrive at the invention of claim 4. The motivation to do so would have been to eliminate counting to infinity problems noted by Murthy (Introduction, end of first paragraph).

31. With regard to claims 5-7, Perkins discloses all aspects of the invention of claim 1 but fails to disclose the entries in the routing table, route tag, and distance table. However, Murthy discloses all of the elements of claims 5-7 as set forth in the rejections of claims 24-26, except that the route tag value may contain a value selected from a group consisting essentially of correct, null, error, or equivalents. However Murthy discloses no other values, so this limitation is satisfied in the method taught by Murthy. It would have been obvious to one ordinarily skilled in the art at the time of the invention to include the tables and route tags disclosed by Murthy with the method disclosed by Perkins to arrive at the invention of claims 5-7. The motivation to do so would have been .

32. Claims 8 and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perkins et al. in view of Johnson et al., "DYNAMIC SOURCE

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ROUTING IN AD-HOC WIRELESS NETWORKS," Mobile Computing, pp. 1 thru 18, 1994.

33. With regard to claim 8, Perkins discloses all aspects of the method of claim 1, specifically tracing routes to destinations upon receiving data packet traffic for a destination, but fails to disclose the routing link discoveries. However, Johnson discloses a method of routing data packets (Dynamic Source Routing) wherein routing links to a given neighbor (host B, page 7 fig 2, described in paragraph 1 of section 4.1, "since hosts B and C are on the route to D, host A also learns the route to both of these hosts from its route discovery for D") are discovered only ("...no periodic routing advertisement messages...", page 2 last paragraph) in response to traffic for destination (D) for which no correct route (if no route is found, the sender may attempt to discover one using the route discovery protocol) exists in the routing table (route cache) (page 4, section 3.1 paragraph 2). It would have been obvious to one ordinarily skilled in the art at the time of the invention to combine the neighbor link discovery method disclosed by Johnson with the method of claim 1 disclosed by Perkins to arrive at the invention of claim 8. The motivation to do so would have been that the method disclosed by Johnson allows neighbor link discovery only when it is necessary to trace a route through a neighbor, thereby reducing the network bandwidth overhead and conserving battery power, as suggested by Johnson in the last paragraph on page 2. For the same reasons it would have been obvious to use the method disclosed by Johnson to

34. With regard to claims 10-12, Perkins discloses all aspects of the method of claim 9 but fails to disclose the aspects of claims 10-12. However, Johnson discloses a method of dynamic tracing of routes (Dynamic Source Routing) wherein dynamic tracing of routes to the destination is performed by sending query commands (route request packet) to discover routing information (route cache entry for the target of the request) from neighboring nodes (a host that receives a route request packet, where the host is B of fig 2 and the sender of the route request packet is A of fig 2) (see page 7, section 4.1, paragraph 3), wherein a query table (route cache) is maintained to control the extent to which a query is forwarded (page 8, middle paragraph, "... if a host receives a route request and is not the target of the request but could reply from its cache, the host instead discards the request..."), wherein the extent of forwarding is controlled by tracking the number of hops the query has made from the sender in relation to the forwarding limit and the forwarding limit comprises a predetermined maximum hop count value (page 8, last paragraph, particularly items 1 and 2). It would have been obvious to one ordinarily skilled in the art at the time of the invention to include the query control method disclosed by Johnson with the data packet routing method disclosed by Perkins to arrive at the invention of claims 9-12. The motivation to do so would have been to limit the network bandwidth consumed by routing information overhead, thereby inexpensively checking for a target node.

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35. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson et al. in view of Perkins et al.

36. Johnson discloses a method for routing data packets in a wireless network at a node i, comprising creating a route for a destination j (Route discovery, page 4 section 3.2) by broadcasting a query out to all neighbors ("route request packet which may be received by those hosts within wireless transmission range of it", page 5 lines 1-4); forwarding node (hosts within wireless transmission range) will forward a query to all its neighbors only if it does not have a route to the destination j (page 5, item 4., "Otherwise, append this host's...") and if the number of hops query packet has already been forwarded by < MAX HOPS (page 8, item 2 of list near bottom of page) and it has been greater than query-receive-timeout (d, page 8 items 1 and 2 of 3-item list near top) since the last query forwarded for that destination whereby only local clocks used for query-recv-timeouts ("a host performs...Pick a delay period...delay transmitting the route," and nowhere does Johnson disclose that this delay period uses any clocks outside of the host that picks the delay period) ; broadcasting back an update instead of forwarding a query if a route to destination j exists (page 5 item 3 of 4-item list) and the route value to i decreases from infinite to finite after processing the query (item 3 states that the route request reached the host, and a request could not have reached the host had the route been infinite); wherein when the update reaches l (initiator), i has a route to j (copy of this route...to the initiator, item 3 of page 5). Johnson fails to explicitly disclose that the route is created only when a data

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packet for j arrives. However, Perkins discloses receiving data packet traffic for a destination node and dynamically tracing a route to said destination node as set forth in the rejection of claim 1, and this is seen to be equivalent. It would have been obvious to one ordinarily skilled in the art at the time of the invention to combine the query broadcast and forward scheme disclosed by Johnson with the on-demand path tracing explicitly disclosed by Perkins to arrive at the invention of claim 31. The motivation to do so would have been to have a pure on-demand routing method with an improved query broadcast and forward scheme for efficiently using overhead bandwidth.

Conclusion

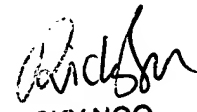
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher P. Heinrichs whose telephone number is 571-272-8397. The examiner can normally be reached on Monday through Friday, 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ricky Ngo can be reached on 571-272-3139. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


C. Heinrichs
A.U. 2663


RICKY NGO
PRIMARY EXAMINER

4/18/05